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# Musical feature–Self reported Emotion Database (MuSED): Empirical findings on affect associate with music

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## Abstract

Musical features contribute to expressing and evoking distinct emotions. However, evidence regarding the associations between musical features and emotion remains fragmented, making it difficult to confirm musical features–emotion association (MEA) efficiently. To address this gap, we introduce the *Musical feature – Self reported Emotion Database* (MuSED), which documents 1,326 MEAs drawn from 92 empirical sources spanning 134 years of research (1892–2026). After reviewing MEAs in the database, we found that tempo and loudness showed a robust association with emotional arousal, whereas mode and valence are closely associated. For individual emotions, happy and sad are the most extensively studied and show the most consistent associations with a wide range of musical features, while internal (felt) locus and more profound emotional experiences are less explored. The database provides researchers, educators and composers with a structured, evidence-based resource for understanding how musical features relate to a range of affective experiences. The database highlights both well-established findings and important gaps in the literature, offering a simple but effective tool for future research on music and emotion, developed in accordance with the FAIR Data Principles (Findable, Accessible, Interoperable, and Reusable).


Keywords: music and emotion; affect; locus; self-reported; valence-arousal-dominance (VAD); discrete emotions; database.

## Introduction

Emotion in music has intrigued both lay listeners and specialists for centuries. Music theorists, philosophers, and psychologists have long been interested in understanding how musical features evoke emotional responses, and which particular musical features appear to be associated with specific affective experiences. While philosophical discussions of music and emotion can be traced back many centuries (Anderson, 1966; Enea, 2022), here we focus on modern empirical techniques of musical features–emotion association (MEA) that developed in the nineteenth century.

The foundations of empirical work are often attributed to the research tradition established by Wundt (Chmiel & Schubert, 2017; Wundt & Judd, 1897), whose studies concerned participants' preference ratings and affective reactions to sensory stimuli. However, the earliest English-language study we have located that explicitly addresses concepts resembling contemporary self-reported emotion of musical structure is Gilman (1892), who provided both observations and a degree of scepticism regarding the possibility of systematically linking musical features to emotional responses. Following these early investigations, we observe a hiatus in listener-based English language papers of MEAs, lasting nearly three decades.

Notably, this period coincided with the rise of behaviourism, a movement that encouraged systematic investigation of observable responses (Watson, 1913, p. 158), but discouraged investigation of emotion because it was an inner state that could not usually be observed (Kleinginna & Kleinginna, 1981). Apart from a small number of exceptions, the field did not experience a substantial resurgence until Hevner's (1935, 1936, 1937) pioneering papers which established the first sustained, systematic program of research on the musical features

associated with emotional responses. Across these works, several features were repeatedly associated with particular emotions, such as: major mode – happy; minor mode – sad; fast tempo– exciting; and slow tempo – calm, laying the groundwork for subsequent investigations.

Some authors (McMullen, 1982; Schubert, 2003) have argued that Hevner successfully anticipated aspects of the now commonly accepted dimensional approach to emotion (Eerola & Vuoskoski, 2011), where emotions are mapped along a small number of underlying dimensions, a framework more commonly associated with Russell's (1980) circumplex model. Although the dimensional approach provides a parsimonious framework for investigating affective experience evoked by music, it may seem simplistic because music-induced affective responses comprise qualitatively distinct forms of experience. For example, Sloboda (Sloboda, 1991) examined musical features associated with physical reactions such as chills and tears, identifying these responses as indicators of peak emotional intensity, which do not map neatly into typically used emotion dimensions. Similarly, the influential work by Gabrielsson and Wik (Gabrielsson & Wik, 2003) treated strong experiences with music as a distinct topic and documented additional experiential states that were, again, not typically mapped onto emotion dimensions, such as transcendence, awe, and spirituality. Schubert et al. (2017) argued that, instead, these experiences are characterised by deep hedonic tone (DHT) and are phenomenologically distinct from conventional emotions. We are of the view that there is benefit in embracing a wide range of emotion models and labels.

Previous secondary literature collating MEAs has been historically sporadic. Hevner's work can be considered the first systematic program to collate MEAs, with a slowly building stream of review chapters . By the end of the last century they were being closely tied to the growing empirical interest in the question (Abeles, 1996; Gabrielsson & Lindström, 2001;

McMullen, 1996; Radocy & Boyle, 1988; Rigg, 1964; Schubert, 1999). These papers were narrative overviews or reported a small number of papers that identified a particular MEA. With interest in MEA not abating, such models of reviewing literature are becoming increasingly limited in supporting researchers' ability to identify replication of and conflict in MEAs. Despite the continued interest, there are three broad and basic reasons for the stagnation of more comprehensive MEA collation: (1) heterogeneity of musical feature descriptions; (2) heterogeneity of emotion models and labels and (3) diversity of emotion locus (felt versus expressed).

First, musical features are treated inconsistently and described at different analytical levels, sometimes leading to overlapping results. Timbre provides a compelling example. Depending on the analytical perspective, it may be defined in terms of perceptual descriptors such as brightness or roughness, or through physical (e.g. spectral) and temporal (attack rise time) properties. These definitions are not mutually exclusive and often capture overlapping aspects of the same feature. The nature of the music stimuli used in such research is immensely varied, from controlled, specially created auditory stimuli, through to naturalistic selection and uses of music (Sloboda, 1999; Tervaniemi, 2023).

Second, the coexistence of multiple emotion models and labeling systems complicates efforts to establish clear correspondences between musical features and emotions. Work by Eerola and Vuoskoski (Eerola & Vuoskoski, 2013) identifies discrete and dimensional models as the two most widely used broad emotion descriptive systems in music and emotion research. Although researchers may favour one approach over the other, these frameworks should, in principle, be reconcilable within a unified conceptual structure. Yet both frameworks present challenges. Within discrete models, semantically related terms (e.g., joy, excitement, and

pleasure), as well as different lexical forms of the same emotion (e.g., sad vs. sadness, angry vs. anger), are sometimes used as distinct emotion labels across papers, or are absorbed into coarse emotional categories (Eerola & Saari, 2025; Hevner, 1936; Jacobsen et al., 2025; Schubert et al., 2020; Zentner et al., 2008). Furthermore, the meaning and usage of emotion labels may have changed over time (Schubert, 2003). For example, Hevner (1937) used 'gay' in the happy adjective group, reflecting a meaning that differs substantially from its predominant contemporary usage.

Lastly, some papers, particularly earlier ones, are not conscious about which locus of emotion they investigate, especially those appearing prior to Gabrielsson (2001). Locus refers to the perspective taken by the listener, and can be broadly classified as either internal or external. Internal locus concerns emotions experienced by the listener, whereas an external locus concerns emotions attributed to the music itself. As discussed by Schubert (Schubert, 2013), an internal locus emotion is typically indicated by instructions such as "I feel…", "I am…", "I experience…", or prompts asking whether the music "makes me feel…", "induces…", or "evokes…" particular emotions. In contrast, an external locus is commonly reflected by instructions asking participants what emotion the music "expresses", "conveys", or what emotion they perceive the music to express. The distinction between these two loci can be significant for MEA research. Evans and Schubert (2008) found that assuming equivalence between felt and perceived emotion could lead to conflicting emotional responses more than 30% of the time. Therefore, failure to properly account for emotional locus may obscure genuine music-emotion relationships and contribute to inconsistencies across the literature.

Despite decades of research identifying MEA, the overall task of locating and comparing evidence for specific MEAs remains challenging. To date, databases examining emotional

responses to music stimuli have been developed, such as PUMS, which contains emotion labels provided by researchers for selections of music (Warrenburg, 2021) and EMMA, which is based on listener-generated emotion annotations (Strauss et al., 2024). Such resources are immeasurably helpful for those seeking to understand what, if any, consensus exists about emotions in specific pieces of music. And such papers can be used to extract more general relationships about how specific musical features impact on emotion, but are limited by simultaneous interdependencies of musical features that inevitably coexist in much artistically (rather than experimentally) created music.

Studies synthesising MEAs have also been limited by reporting positive results, with rare consideration of counterexamples and why they might exist (Gabrielsson & Lindström, 2001; Livingstone et al., 2012). We believe there is need for a comprehensive list of MEAs in an accessible form that consolidates findings, regardless of inconsistencies in results. In response to this limitation, we introduce here the *Musical feature – Self reported Emotion Database* (MuSED) resource, consisting of a compilation of MEAs derived from self-reported emotional responses to music. Such a compilation of published research is intended to facilitate easy access to robust patterns and research gaps, while reducing the effort required to navigate a rapidly growing body of empirical research. This knowledge may also support more informed choices in music selection, composition, education, and research. We first describe MuSED, after which we demonstrate its efficacy by reporting selected overviews and analyses that the database facilitates.

## Development and Description of MuSED

A primary purpose of MuSED is to allow easy access to replication-based evidence of any particular MEA. Papers were eligible for inclusion if they:

a) reported original empirical findings that permitted identification of at least one musical feature-emotion association (MEA);
b) reported associations based on analysis of participant self-reports using verbally labelled emotions, affective states, or related affective experiences;
c) provided sufficient information to permit extraction or inference of the reported MEA;
d) were published in English or available through an English translation; and
e) were published in peer-reviewed journals or, in some cases, influential peer-reviewed conference proceedings that made substantive empirical contributions to the field.

Due to the lack of standardisation in MEA terminology and evolving meaning, we adopted an organic search approach to gathering the literature, repeatedly refining database searches and consulting both references and citations of relevant articles to identify additional ones. The papers included in MuSED span research from October 1892 to the first part of 17 April 2026.

The database consolidates heterogeneous terminology into standardised, yet reasonably flexible, descriptors. Each database row lists a specific MEA represented by six variables: (1) musical feature (1a. source and 1b. consolidated), (2) emotion label (2a. source and 2b. consolidated), 3. valence/arousal region, 4. dominance region, 5. emotion locus, and 6. source

publication (APA reference as well as ancillary columns). Musical features and emotion labels were abstracted from each included publication through codebooks that link source terminology with consolidated terms. Both the original and consolidated forms are retained within MuSED to ensure transparency. Consolidation was necessary because terminology varied substantially across papers and historical periods.

For emotion labels, we favoured consistent contemporary terminology while preserving the conceptual distinctions intended by the original authors. Where studies reported groups of semantically related terms, such as the emotion clusters proposed by Hevner (1936), responses could be aggregated under a representative label. For example, the cluster containing tender, sentimental, and yearning was represented by the label Tender. All authors independently cross-checked the coding, and we also lemmatised emotion terms and merged closely related variants with similar meanings (for example, sad and sadness are consolidated as sad), while recognising the overlapping conceptual boundaries that characterise emotion concepts (Fehr & Russell, 1984).

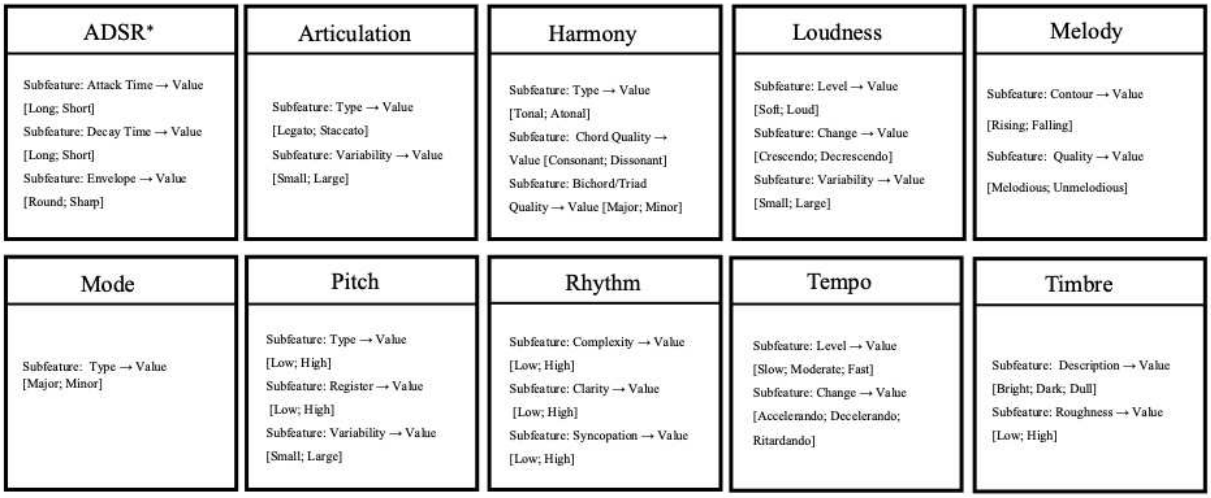
It should be noted that the term *emotion* is used here in a broad sense, as is common in the aesthetic and music psychology literature (Schindler et al., 2017; Zentner et al., 2008), to include a wider range of affective experiences rather than being restricted to basic emotions such as happy, sad, and anger. In this light, MuSED includes not only basic emotions but deep hedonic tone (DHT) experiences (Konečni, 2005; Schubert, 2022; Schubert et al., 2017) to accommodate a wider range of studies than previously considered, thus making MuSED more comprehensive than previous compilations. However, responses closely related to preference (such as liking and enjoyment) were not a focus of the database since they have known relationships with the listener-music interaction variables such as familiarity and subjective complexity, rather than

musical features (Chmiel & Schubert, 2017). To facilitate the comparison between papers using different emotion models, each discrete emotion label was also mapped to a position in the Valence (degree of positivity and negativity)–Arousal (degree of activation)–Dominance (degree of control) (VAD) space to facilitate cross-label comparisons, based on established reference values (Mohammad, 2025).

For musical features, terms used to describe an identified musical feature construct were treated as equivalent when they referred to sufficiently similar underlying acoustic, digitised or musical properties (e.g., forte dynamics, high sound level and loud were all coded as part of the Loudness feature with the specific, consolidated musical feature variable level of Loud). This led to 10 general feature categories: ADSR, Articulation, Harmony, Loudness, Melody, Mode, Pitch, Rhythm, Tempo and Timbre. These features were further organised into hierarchical subfeature categories as required until the value of the variable that was manipulated was identified. For example, within the Timbre feature one subfeature was Spectrum, which could further be classified into the subfeatures of: Noisiness, Spectral Centroid, Spectral spread. Spectral spread itself was then further classified into the nested subfeature of Range (of the spread). To maximise compatibility the values of the lowest subfeature level were usually dichotomised, but not exclusively (e.g., for Loudness: loud, soft; but for Timbre-description: bright, dark, dull), as shown in Figure 1. It is worth noting that, within the classification shown in Figure 1, the discussion regarding the "musical feature and emotion association (MEA)" actually refers to the associations between an emotion and a specific value of subfeatures of music. For the sake of conciseness, however, we will continue to use the expression "musical feature and emotion association (MEA)" throughout this paper.

The main intention of MuSED is to collate overall (main) and simple effects reported in the literature, thus not considering the role of interactions. Interactions between musical features are studied relatively rarely in the literature. Eerola et al. (2013) showed that the impact of multiple musical features on emotion is generally additive. For example, while a slow tempo might be used to convey sadness in a piece, the use of this slow tempo in conjunction with long, connected notes (legato articulation) or a minor mode would likely convey additional sadness, and the use of all three features collectively would likely convey the most sadness.

Figure 1. *Classification of musical features used for data consolidation in MuSED*




*Note.* The titles of each box shows the consolidated musical feature category label. Within each category, the musical feature appears to the left, with descending level of nested subfeatures indented. For each row an arrow followed by a square bracketed list indicates the values that the subfeature adopted in MuSED that is used for further analysis (counts, descriptive statistics etc.). Only musical feature categories examined in ≥10 papers are included in the table.
The transition from the data in each study to this standardised classification is achieved through a 'musical feature codebook', a separate data sheet in MuSED, which maps the terminology used in the source paper to the consolidated musical features listed in the figure.
*ADSR refers to attack, decay, sustain, and release portions of (usually a single) tone. It typically refers to the duration of one or more portion of the note, but can also refer to other parameters such as intensity during one or more portions (see, e.g., Almeida et al., 2024).

Finally, four emotional locus categories were coded for each MEA in MuSED: external, internal, unspecified, and both. In cases where emotional locus was reported implicitly, we relied on interpretation of participant instructions or any other clues. MEAs that could not be classified were coded as unspecified, whereas ones involving both external and internal loci were coded as both.

## Results and Discussion

The search strategy led to a total of 1,326 MEA combinations reported across 92 papers, including multiple findings (replications) of the same MEA combination sometimes within the same publication. MuSED findings were tallied across the database to identify:

(1) Historical trends of research involving musical features, emotion labels, and emotion locus;

(2) Frequently replicated musical feature - emotion associations;

(3) Frequently conflicting musical feature - emotion associations;

(4) Associations between musical feature and deep positive affect.

### Finding 1: Historical trends

#### Musical Features

Across the literature, pitch (reported in 38 papers), loudness (38), and tempo (43) dominate research attention and represent the most frequently studied musical features (see Table 1). Early music-emotion research considered features such as mode, rhythm, harmony, phrasing, simple-complex harmony, and firm-flowing rhythm (Hevner, 1935, 1937). The development of digital signal processing, Music Information Retrieval (MIR), substantially broadened this

feature space by enabling the extraction of low-level acoustic descriptors directly from audio signals, including spectral, energy, and temporal-envelope measures (Hayes et al., 2024). While there are overlaps between the symbolic/psychological and MIR based features, there is considerable bifurcation in research between high level, symbolic/musical/psychological approaches and low-level, digitally driven MIR based analyses (e.g., ADSR, and timbre) which we attempt to reconcile for MuSED as shown in Figure 1.

*Table 1* Historical distribution of examined musical features in MuSED

| **Musical features categories** | 1890–1899 | 1920–1929 | 1930–1939 | 1940–1949 | 1970–1979 | 1980–1989 | 1990–1999 | 2000–2009 | 2010–2019 | 2020– | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ADSR | | | | | 2 | | 2 | 1 | 3 | 4 | **12** |
| Articulation | | | 2 | | 1 | 2 | 6 | 5 | 4 | 3 | **23** |
| Harmony | | 1 | 3 | | | 3 | 6 | 4 | 3 | 5 | **25** |
| Loudness | | 1 | 3 | 1 | 2 | 1 | 8 | 8 | 7 | 7 | **38** |
| Melody | | | 1 | | 1 | 3 | 4 | 1 | 1 | 1 | **12** |
| Mode | | 1 | 4 | | 1 | 3 | 6 | 1 | 5 | 9 | **30** |
| Pitch | 1 | 1 | 4 | 1 | 2 | 3 | 5 | 8 | 6 | 7 | **38** |
| Rhythm | | | 4 | | 3 | 2 | 3 | 3 | 4 | 3 | **22** |
| Tempo | | | 4 | 2 | 3 | 3 | 11 | 9 | 7 | 4 | **43** |
| Timbre | | | 1 | | 2 | | 3 | 3 | 6 | 8 | **23** |

*Note*. Only musical feature categories examined in ≥10 papers are included in the table to facilitate clearer visualisation. The totals do not equal the actual number of papers because one study may investigate more than one musical feature.

**Emotion labels**

Broadly speaking, the MEA literature included in MuSED exhibits an overall uneven distribution of emotion labels (see Table 2). Happy (linked to a musical feature in 46 papers) and sad (45) dominate the field, followed by angry (21), valence (20), fear (16), tension (16), and tender (14). More profound experiences, which may serve as core indices of aesthetic experience or, in other words, DHT experiences, such as beauty, chills, and mystery appear only sporadically, while awe and being moved did not appear (see Table 2) as they were investigated an insufficient number of times (one study located for each).

Historically, Gilman (Gilman, 1892) provided the earliest cited contribution to this line of research, but substantial growth in literature investigating emotions did not occur until the late 1920s, when the range of emotions assessed also became increasingly diverse. At around this period, as shown in Table 2, happy, dignity, and tender were the most frequent emotions associated with some musical feature. However, both the diversity of emotions and the number of papers declined in the ensuing 60 years. Peer reviewed journal activity increased considerably again in the 1990s, accompanied by greater attention to negative emotions, particularly anger and fear, while happy and sad also remained consistently prominent throughout this period.

A more substantial shift emerged at the turn of the 21st century. Dimensional constructs such as valence and arousal became increasingly prevalent. Valence-related papers rose steadily from occasional reports before 2000 to five in the 2000s, four in the 2010s, and ten from 2020 until the current release of MuSED. Arousal (labelled as energy or activity in some papers) remained less frequently studied than valence across all periods. Overall, these trends suggest a growing influence of dimensional approaches to emotion, particularly through the adoption of Russell's (1980) circumplex model in music and emotion research (Collins, 1989), although

discrete emotion models (e.g., basic emotions) remain prominent in the literature, particularly with the explicit application of basic emotion theory through influential work of Juslin (Gabrielsson & Juslin, 1996; Juslin, 1997a). This demonstrates the historical favouring of a small set of basic emotions and dimensions while giving comparatively limited attention to more nuanced, complex, or DHT experiences (see Table 2 ).

Table 2. *Historical distribution of examined emotions in MuSED*

| Emotions | 1890–1899 | 1920–1929 | 1930–1939 | 1940–1949 | 1970–1979 | 1980–1989 | 1990–1999 | 2000–2009 | 2010–2019 | 2020– | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Activity | | | | | 1 | | 2 | 4 | | 1 | **8** |
| Agitation | | | 1 | 2 | | | | | | | **3** |
| Angry | | | | | 2 | | 8 | 6 | 3 | 2 | **21** |
| Arousal | | | | | | | | 1 | 5 | 4 | **10** |
| Beautiful [DHT] | | | | | | 2 | 1 | | | | **3** |
| Calm | | | 3 | | 1 | | | 1 | 1 | 4 | **10** |
| Chills [DHT] | | | | | | | 2 | 1 | | 1 | **4** |
| Dignified | | | 5 | 2 | 1 | | 2 | 1 | 1 | | **12** |
| Dull | | | 1 | | 1 | | 1 | 1 | | | **4** |
| Energy | | | | | 1 | 1 | | 1 | 3 | 6 | **12** |
| Exciting | | | 3 | 1 | 1 | 1 | 1 | 1 | | | **8** |
| Fear | | | | | 2 | | 6 | 5 | 1 | 2 | **16** |
| Graceful | | | 2 | | 1 | | | | | | **3** |
| Happy | | 1 | 5 | 3 | 1 | 5 | 13 | 7 | 6 | 5 | **46** |
| Humorous | | | 3 | 1 | | | | | | | **4** |
| Lamentation | | | 2 | 1 | | | | | | | **3** |
| Longing [DHT] | | | 2 | | | | | 1 | | | **3** |
| Melancholy | 1 | 1 | 2 | 1 | | 1 | | | | | **6** |
| Mysterious | | | 1 | 1 | | | 1 | | | | **3** |
| Peaceful | | | | 1 | | 1 | 1 | 1 | | 1 | **5** |
| Pleasure | | | | | | 1 | | | | 3 | **4** |
| Potency | | | | | 1 | | | 2 | | | **3** |
| Powerful [DHT] | | | | | 1 | 1 | | 1 | 1 | 2 | **6** |
| Relaxation | | | | | 1 | 2 | | 1 | | 1 | **5** |
| Sad | | 1 | 3 | 2 | 2 | 4 | 12 | 9 | 7 | 5 | **45** |
| Scary | | | | | | | | 1 | | 2 | **3** |
| Surprise | | | | | 1 | | | 0 | 0 | 2 | **3** |
| Tender | | | 4 | | 1 | | 3 | 2 | 2 | 2 | **14** |
| Tension | | | | | | 3 | 1 | 3 | 4 | 5 | **16** |
| Tranquil | | | 2 | | 1 | | | 0 | 0 | 0 | **3** |
| Triumphant | | | 3 | 1 | | | | 1 | 0 | 0 | **5** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Valence | | | 1 | 1 | 1 | 1 | 4 | 4 | 8 | **20** |
| Valence: Negative | 1 | | | | | 1 | 2 | 1 | 2 | **7** |
| Vigorous | | 3 | | | | | 1 | 0 | 0 | **4** |

*Note:* Emotion refers to the consolidated emotion label used in MuSED. The table includes only emotion investigated in at least three papers in MuSED. Less frequently investigated emotion (n < 3) were excluded for improved clarity. [DHT] indicates Deep Hedonic Tone experiences which were independently selected, discussed, and compared by the three authors based on Schubert's (2022) lexicon.

**Emotion loci**

The majority of reviewed papers examined external locus of emotion (63 papers), compared to 27 papers examining internal locus. As depicted in Table 3, external locus was more frequent in earlier literature, and particularly in the 1930s and 1940s. This ostensibly results from a belief held by researchers at the time that observing emotion in the music would be less subjective than reporting felt emotion (Schubert, 2013). While the number of studies investigating internal locus has gradually increased, the number of research investigating external locus has shown a slight but steady decline. As a result, interest in MEA from an internal locus perspective is now (since the 2020s) as common as external locus based papers. Moreover, although some papers did not explicitly define locus, we were able to classify them based on the instructions provided to participants. However, five papers were difficult to classify (see e.g., Adachi & Trehub, 1998; MacDorman, 2007).

Table 3. *Historical distribution of emotion locus in MuSED*

| **Locus** | 1890–1899 | 1920–1929 | 1930–1939 | 1940–1949 | 1970–1979 | 1980–1989 | 1990–1999 | 2000–2009 | 2010–2019 | 2020– | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal | | 1 | | | 1 | 3 | 5 | 2 | 5 | 10 | **27** |
| External | | 1 | 6 | 4 | 2 | 4 | 14 | 12 | 11 | 9 | **63** |
| Unspecified | 1 | 1 | | | | | 2 | 1 | | | **5** |

*Note*. This table includes all papers in MuSED. The totals do not equal the actual number of papers because one study may investigate more than one musical feature with different locus.

### Finding 2: Consistent Musical feature - Emotion Associations

Table 4 summarises all MEAs at the subfeature value level that were reported in at least two reviewed papers. Each cell reports two complementary indicators of evidence in fraction format. The denominator indicates the number of papers reporting subfeature value-emotion relationships classified under a musical subfeature in MuSED, whereas the numerator indicates the number identifying a subfeature value-emotion relationships reported. Thus, the denominator reflects the amount of research attention devoted to a relationship, while the numerator provides an indication of its prevalence and cross-study consistency with regard to whether a particular subfeature value dominates over the other values for that subfeature. For example, a value of 18/18 for happy-major mode indicates that 18 of the 18 papers investigating happy and mode reported an association with the (consolidated) major mode value. Importantly, papers may report multiple subfeature value–emotion relationships within the same musical subfeature. Therefore, the resulting proportions should be interpreted relative to the total number of papers investigating the corresponding emotion–musical feature category relationship, rather than as proportions of mutually exclusive subfeature values. Together, these values allow readers to distinguish between MEAs that are both widely studied and consistently reported, those that are widely studied but yield mixed findings, and those that appear highly consistent but have been investigated only a small number of times.

Among discrete emotion labels, happy and sad were by far the most frequently investigated emotions, and they revealed largely contrasting musical profiles, consistent with their opposite positions in affective space. Happy was typically characterised by major mode (18/18), fast tempo (21/21 – 21 out of 21 papers reported fast tempo as happy, three reported tempo other than our consolidated value of 'fast' compared to 'slow'), high loudness (11/12), staccato articulation (11/12), high pitch (7/7) and so on. In contrast, sad was commonly associated with slow tempo (20/20), minor mode (14/15), legato articulation (12/12), soft loudness (13/13), low pitch (6/6) and so on. However, the two emotions differed not only in the direction of their associated musical features but also in the consistency of the reported findings. Although some papers linked happy to slow tempo and reported contradictory results regarding loudness variability, the musical profile of sad showed substantially greater agreement across papers.

A similar contrast emerged between anger and fear MEAs. Both emotions were associated with fast tempo (anger: 12/12; fear: 6/8), staccato articulation (anger: 5/8; fear; 5/8), and minor mode (anger: 4/4; fear: 3/3). Nevertheless, they differed in their associations with loudness: anger was typically characterised by high loudness (10/11), whereas fear was more frequently associated with soft loudness (8/9), and large loudness variability (4/5).

Tender (14 papers), is another more frequently reported positive emotion, was consistently associated with slow tempo (6/6), legato articulation (5/6), and soft loudness (4/4). Tension was most frequently associated with minor mode (7/7), and high loudness (4/5). Interestingly, among the emotions summarised in Table 4, tender was the only emotion showing inconsistent associations with mode. While three papers associated tender with major mode, two reported associations with minor mode.  This is consistent with the previous empirical finding

that tender and sad are interdependent concepts (Dufour & Tzanetakis, 2021; Eerola & Vuoskoski, 2011; Gabrielsson & Juslin, 1996). Given that tender itself is a positive valence emotion, whereas sad is negative valence emotion, the interdependence may explain the contradictory relationship between mode and tender.

MuSED was developed with two consolidations of emotion labels, one largely retaining the discrete nature of emotion and the other an even broader categorisation based on geometrically oriented Valence-Arousal space divided into more or less rotating quadrant sized regions about the centre. These are depicted through icons in the first column of Table 4 (see also the table note), and from it some broader observations can be made.

Valence has a stable association with mode. Major mode is associated with the positive valence specifying as the dimensional label (7/7). When mapping discrete emotions onto the dimensional space, we find that among the 25 papers investigating the relationship between mode and discrete emotions in Q1 (+Valence/+Arousal; e.g., happy, energy), and Q4 (+Valence/−Arousal; e.g., peaceful, calm), only five report minor mode, whereas the remaining papers report major mode. Similarly, among the 23 papers investigating the relationship between mode and discrete emotions in Q2 (−Valence/+Arousal; e.g., angry, fear), and Q3 (−Valence/−Arousal; e.g., sad, sorrow), only two papers report major mode, and the remaining ones report minor mode. These associations show a considerable degree of consistency between dimensional and discrete emotion frameworks. And it may also suggest that the association between mode and valence is generally stronger than that between mode and arousal, even when the direction of two dimensions are decoupled.

The quadrants encapsulating arousal related emotion labels also produced notable consistencies, particularly for tempo. When mapping discrete emotions onto the dimensional

space, we find that among the 40 papers investigating the relationship between tempo and emotions in Q1 (+Valence/+Arousal; e.g., happy, energy) and Q2 (−Valence/+Arousal; e.g., angry, fear), only eight report slow tempo and three report moderate loudness, whereas the remaining papers report fast tempo. Similarly, among the 27 papers investigating the relationship between loudness and emotions in Q3 (−Valence/−Arousal; e.g., sad, sorrow) and Q4 (+Valence/−Arousal; e.g., peaceful, calm), only three report fast tempo and one reports moderate tempo, whereas the remaining papers report slow tempo. These would suggest that the relationship between tempo and arousal is stronger than relationships involving many other features. Overall, the association between tempo and arousal showed little evidence of contradiction in MuSED. Counterexamples could also be explained. For example, in Bresin and Friberg (2000), dignified (referred to as solemnity in the text) was grouped within the fast-and-loud cluster in the principal component analysis, while its actual tempo was substantially slower than those associated with happy and angry.

**Finding 3: Inconsistent Musical feature - Emotion Associations**

Papers using time-continuous response approach have shown that variations in loudness can strongly predict listeners' judgments of changes in arousal, in some cases outperforming other musical features such as tempo and pitch (Dean et al., 2011; Schubert, 2004). However, the reviewed papers suggest that the stability of loudness–emotion associations is asymmetric.

Specifically, the association between soft loudness and negative-arousal emotions demonstrates relatively stable cross-study consistency. Among the 18 papers investigating the relationship between loudness and emotions in the Q3 (−Valence/−Arousal; e.g., sad, sorrow) and Q4 (+Valence/−Arousal; e.g., peaceful, calm), 16 report associations between various

negative-arousal emotions and soft loudness, while one reports an association with moderate loudness and two report associations with loud loudness. However, although the association between high loudness and positive-arousal emotions shows greater inconsistency. Among the 27 papers investigating the relationship between loudness and emotions in the Q1 (+Valence/+Arousal; e.g., happy, energy), Q2 (−Valence/+Arousal; e.g., angry, fear), 26 report associations between various positive-arousal emotions and high loudness, while one reports an association with moderate loudness. Meanwhile, 11 papers report associations between soft loudness and positive-arousal emotions, eight of which specifically concern the association between fear and soft loudness.

This is consistent with the findings of Juslin (1997) and Micallef Grimaud & Eerola (2022). Notably, this relationship between soft loudness and fear may be explained by the dominance dimension. For example, fear (V = −.854, A = .680) and anger (V = −.756, A = .660) occupy similar positions in the valence–arousal space, but they differ substantially in dominance, with anger being associated with positive dominance (.314) and fear with negative dominance (−.414) according to Mohammad (2025). Anger and fear therefore present a rare example where dominance is more clearly connected to MEA than valence-arousal. Low dominance (submissiveness) emotions are indicated with a downward pointing triangle symbol in column 2 of Table 4.

Furthermore, as shown in the cell with font in grey shading in Table 4, articulation had considerable inconsistency across papers, with both staccato and legato being related to valence (staccato: 3/4, legato: 2/4), tender (S:5/7; L: 2/7), angry (S:6/10; L:2/10), fear (S:6/10; L:2/10), and tension (S:2/4; L:2/4). In most papers, articulation was not experimentally manipulated as an independent variable but was instead categorised retrospectively. To address this limitation, Carr

et al. (2023) examined the association between several emotions and articulations while controlling other musical features across two experiments. Experiment 1 showed that legato melodies were perceived as calmer and sadder, whereas staccato melodies conveyed greater tension and energy, consistent with the overall patterns observed in the MuSED database. Experiment 2 also included mode manipulation (major vs. minor) and found that although articulation had a significant effect on perceived happy ($\eta p^2 = .08$), this effect was much smaller than that of mode ($\eta p^2 = .71$). Specifically, staccato slightly increased happy ratings for minor-mode melodies, but not enough to overcome the negative emotional character of the minor mode. Furthermore, in the series of studies by Gabrielsson and Juslin (1996), Juslin (2000), and Juslin and Laukka (2003), anger was associated with non-legato, staccato, as well as legato articulation. These inconsistent findings could be explained by using different musical instruments (e.g., violin, piano, and guitar) across papers, which may have moderated the association between articulation and perceived emotion, and the benefit of mixed articulation values for communicating anger. Taken together, these findings suggest that articulation may not necessarily be an unstable emotional cue itself. Rather, its contribution to perceived or felt emotion should be interpreted alongside other musical features, such as mode. This supports the notion that musical features have an overall additive impact on emotion, and that different musical features have different effect sizes.

Table 4. *Music emotion association (MEA) value prevalence count summary*

| VA region | Emotion | Mode | Tempo | Loudness | ADSR | Rhythm | Timbre | Articulation | Pitch | Melody | Harmony |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Valence | Type: Major: 7/7 [E6, I1] | Level: Fast: 4/4 [E3, I1] | Level: Soft: 2/2 [E2] | Attack - Time: Short: 3/4 [E3]<br>Attack - Slope: Steep: 2/2 [E2] | | Spectrum - Noisiness: Low: 3/3 [E3]<br>Spectrum - Spectral centroid: Low: 2/3 [E2] | Staccato: 3/4 [E3]<br>Legato: 2/4 [E2] | High: 4/6 [E4]<br>Low: 2/6 [E2] | | Consonant: 2/4 [E2]<br>Tonal: 2/4 [E1, I1] |
| | Amazement | | Level: Fast: 2/2 [E1, I1] | | | | | | | | |
| | Exciting | | Level: Fast: 2/2 [E2] | | | | | | | | |
| | Graceful | Type: Major: 2/2 [E2] | | | | | | | | | |
|  | Happy | Type: Major: 18/18 [E14, I3] | Level: Fast: 21/21 [E15, I5]<br>Change: Accelerando: 2/3 [E2] | Level: Loud: 11/12 [E7, I3]<br>Variability: Large: 2/4 [E2]<br>Variability: Small: 2/4 [E2] | | Varied: 2/8 [E2]<br>Duration contrast: High: 2/2 [E2]<br>Syncopation: High: 2/2 [E1, I1] | Description: Bright: 2/3 [E2] | Staccato: 11/12 [E9, I2]<br>Variability: Large: 3/3 [E3] | High: 7/7 [E6, I1] | Contour: Rising: 2/3 [E2] | Simple: 3/4 [E3]<br>Triad quality: Major: 2/2 [E2] |
| | Humorous | Type: Major: 2/2 [E2] | | | | | | | | | |
| | Love [DIT] | Type: Major: 2/2 [E2] | Level: Moderate: 2/2 [E2] | | | | | Legato: 2/2 [E2] | | | |
| | Surprise | | Level: Fast: 2/2 [E2] | | | | | Staccato: 2/2 [E2] | High: 2/2 [E2] | | |
| | Triumphant | | Level: Fast: 3/3 [E3] | | | | | | | | |
| | Activity | | Level: Fast: 4/4 [E4] | | | | | | High: 4/4 [E4] | | Dissonant: 2/2 [E2] |
| | Arousal | | Level: Fast: 2/2 [I1] | Level: Loud: 2/2 [E1] | Attack - Time: Short: 2/2 [E2] | | Spectrum - Spectral centroid: High: 2/2 [E2] | | High: 2/3 [E1] | | |
|  | Energy | Type: Major: 3/3 [E2, I1] | Level: Fast: 5/5 [E5] | Level: Loud: 3/3 [E2, I1] | | Pulse - Clarity: High: 2/2 [E1, I1] | Spectrum - Noisiness: Low: 2/3 [E2]<br>Spectrum - Spectral centroid: High: 2/2 [E2]<br>Spectrum - Spectral skewness: Low: 2/2 [E2] | Staccato: 3/4 [E3] | High: 2/2 [E2] | | |
| | Potency | | | | | | | | High: 2/2 [E2] | | |
| | Powerful [DIT] | | | | | | | | High: 2/3 [E2] | | |
|  | Angry | Type: Minor: 4/4 [E4] | Level: Fast: 12/12 [E12] | Level: Loud: 10/11 [E10]<br>Variability: Large: 2/4 [E2]<br>Variability: Small: 2/4 [E2] | Attack - Time: Short: 3/3 [E3]<br>Decay - Time: Short: 2/2 [E2] | Duration contrast: High: 2/2 [E2] | Spectrum - Spectral centroid: High: 3/3 [E3] | Staccato: 5/8 [E5]<br>Legato: 2/8 [E2]<br>Variability: Large: 2/3 [E2] | High: 2/3 [E2] | | |
| | Fear∇ | Type: Minor: 3/3 [E2, I1] | Level: Fast: 6/8 [E5, I1]<br>Variability: High: 2/2 [E2] | Level: Soft: 8/9 [E8]<br>Variability: Large: 4/5 [E4] | Envelope: Round: 2/2 [E2] | Duration contrast: High: 2/2 [E2] | Description: Dark: 2/2 [E2]<br>Spectrum - Spectral centroid: Low: 2/2 [E2] | Staccato: 5/8 [E5]<br>Legato: 2/8 [E2]<br>Variability: Large: 3/3 [E3] | High: 2/2 [E2] | | |
| | Tension | Type: Minor: 7/7 [E4, I3] | Level: Fast: 2/4 [E2]<br>Level: Slow: 2/4 [E1, I1] | Level: Loud: 4/5 [E3, I1] | | | Spectrum - Spectral centroid: Low: 2/2 [E2] | Legato: 2/4 [E2]<br>Staccato: 2/4 [E1, I1] | High: 3/4 [E3]<br>Low: 2/4 [E1, I1] | Unmelodious: 2/2 [I2] | Dissonant: 2/4 [E1, I1] |
|  | Valence: Negative | Type: Minor: 3/3 [E2, I1] | | | | | | | | | Dissonant: 2/2 [E2] |
| | Lamentation∇ | Type: Minor: 2/2 [E2] | Level: Slow: 2/2 [E2] | | | Trochaic: 2/2 [E2] | | Legato: 2/2 [E2] | Register: Low: 3/3 [E3] | | Dissonant: 2/2 [E2] |
| | Melancholy∇ | | | | | | | | Register: Low: 2/2 [E2] | | |
|  | Nostalgia∇ | | | Level: Soft: 2/2 [I2] | | | | | | | |
| | Sad∇ | Type: Minor: 14/15 [E10, I3] | Level: Slow: 20/20 [E14, I5] | Level: Soft: 13/13 [E10, I2] | Attack - Time: Long: 4/4 [E2, I2]<br>Envelope: Round: 2/2 [E2] | | Spectrum - Spectral centroid: Low: 3/3 [E2, I1]<br>Description: Dark: 2/5 [E1, I1] | Legato: 12/12 [E11, I1]<br>Variability: Small: 2/2 [E2] | Low: 6/6 [E6] | Contour: Falling: 3/4 [E3] | Triad quality: Minor: 2/2 [E2] |
| | Sorrow∇ | | Level: Slow: 2/2 [E2] | | | | | | | | |
| | Calm∇ | Type: Major: 3/3 [E3] | Level: Slow: 5/5 [E3, I2] | Level: Soft: 2/2 [I2] | | | | Legato: 3/3 [E2, I1] | High: 2/3 [E1, I1] | | |
| | Chills∇ [DIT] | | | Change: Crescendo: 3/3 [I3] | | | | | | | Harmonic progression: Unexpected: 2/2 |
|  | Dignified | Type: Minor: 2/3 [E1, I1] | Level: Slow: 4/5 [E3, I1] | Level: Loud: 2/3 [E2] | | | | Legato: 3/3 [E2, I1] | Low: 3/3 [E3] | | |
| | Peaceful | | Level: Slow: 4/4 [E4] | | | | | | | | |
| | Tender | Type: Major: 3/5 [E1, I2]<br>Type: Minor: 2/5 [E2] | Level: Slow: 6/6 [E5, I1] | Level: Soft: 4/4 [E3, I1] | Attack - Time: Long: 2/2 [E1, I1] | | Spectrum - Spectral centroid: Low: 2/2 [E1, I1] | Legato: 5/6 [E4, I1] | High: 2/2 [E1, I1] | | |
| | Tranquil∇ | | Level: Slow: 2/2 [E1, I1] | | | | | | | | |
| | Relaxation∇ | Type: Major: 2/2 [E1, I1] | | | | | | | | | |

*Note.*

Each cell reports a fraction which is the number of papers identifying a specific MEA value (numerator) over the total number investigating the corresponding emotion–general musical feature category relationship for any value (denominator). Letters in square brackets indicate the locus of emotion considered by participants: E = external locus; I = internal locus; U = unspecified locus; and B = both internal and external loci. For example, Happy-Major mode: “19/20 [E12, I3, U4]” indicates that 19 of 20 papers investigating happy and mode reported an association with major mode; among these 19 papers, 12 were examined external locus (E), 3 as internal locus (I), and 4 as unspecified (U).

VA region column show four quadrants of the Valence and Arousal space respectively: Q1 (+Valence/+Arousal; e.g., happy, energy), Q2 (−Valence/+Arousal; e.g., angry, fear), Q3 (−Valence/−Arousal; e.g., sad, sorrow), and Q4 (+Valence/−Arousal; e.g., peaceful, calm). The region of each label was identified using values from NRC VAD lexicon (Mohammad, 2025).

$\nabla$ indicates negative dominance (e.g., submissive), ones without it indicate neutral or positive dominance.
Only subfeature associations reported by two or more papers are included in the table. Darker shading indicates a greater number of papers reporting the association. Grey shading indicates contradictory findings across papers. The absence of grey shading does not necessarily indicate agreement in the literature, as contradictory findings may exist for associations reported by only one study which (because below the threshold of two) has been excluded from the table. $^{DHT}$ indicates Deep Hedonic Tone experiences and follow the same conventions as those in Table 2

**Finding 4: The associations between musical features and deep hedonic tone (DHT) experiences**

A total of 93 entries of DHT experience were identified in the database, accounting for approximately only 7% of the total. Among these, six DHT experiences—powerful, beautiful, longing, mysterious, chills, and Love—were investigated in two or more papers (see Table 5).

According to MuSED, early explorations of DHT experiences-musical feature associations can be traced back to Hevner (1935) and Rigg (1937, 1939), who investigated experiences such as longing, love, exhilaration, and mystery. Key papers on DHT-musical features began to emerge in the 1990s. For example, Sloboda (1991) investigated the physical responses evoked by music and the corresponding musical structures. He defined physical responses as "high emotional intensity (or 'peaks') separated from one another by experiences of a different, less intense, kind" (p. 111), which corresponds to the DHT experiences discussed here. Sloboda found that tears were associated with sequences and appoggiaturas, and chills were associated with sudden harmonic changes, while further investigation by Panksepp (Panksepp, 1995) found an association between chills and dramatic crescendos. Subsequently, chills have received greater attention due to their unique physical response, with relatively reliable associations being identified across various papers (Beier et al., 2022; Guhn et al., 2007). Apart from chills, other DHT experiences have not yet demonstrated the same degree of cross-study consistency in their associations with musical features. Nevertheless, recent years have seen increasing attention to other specific DHT experiences. For example, Vuoskoski et al. (Vuoskoski et al., 2022) identified associations between being touched and high loudness, pitch, roughness, and noisiness, while Wilson et al. (Wilson et al., 2026) reported a consistent association between awe and dissonant harmony.

We do also acknowledge that this apparent lack of attention on DHT experiences may be partly reflected by the inclusion criteria of MuSED. Some papers may have investigated particular musical feature-DHT experiences associations without being recorded in MuSED because the observed associations were non-significant. For instance, Hevner (Hevner, 1935) investigated an association between awe and mode, but this was not recorded in MuSED because no significance association was identified. Thus, the relatively small number of Musical features and DHT experience associations recorded in MuSED should not necessarily be interpreted as an indication that musical feature and DHT experience associations have failed to attract research attention or have never been investigated; it may also reflect the limited number of reliable associations identified and reported in the literature. At this nascent state of research on DHT experience, the limited investigation could simply be an artefact of scepticism about whether the experience is too subjective to support any systematic relationship. In other words, the state of research on musical features associated with DHT experience is not unlike the start of MEA research in emotion a century ago.

Table 5. *The associations between musical features and deep hedonic tone (DHT) experiences*

| Deep positive affect | Mode | Tempo | Loudness | ADSR | Rhythm | Timbre | Articulation | Pitch | Melody | Harmony |
|---|---|---|---|---|---|---|---|---|---|---|
| Awe: 1 | | | | | | | | | | Dissonant: 1/1 [I1] |
| Beautiful: 3 | Major: 1/1[U1] | Slow: 1/1 [E1] | | | | | | Interval: Perfect fourth: 1/1 [E1]; Perfect fifth: 1/1 [I1]; Major third: 1/1 [E1]; Tritone: 1/1 [E1]; Octave: 1/1 [E1]; Interval Size: Small 1/1 [B1] | | |
| Chills: 4 | | Slow: 1/1 [I1] | Crescendo : 3/3 [I3] | | | Bright: 1/1 [I1]; High roughness: 1/1 [I1] | | Interval - Range: Wide: 1/1 [I1] | | Harmonic progression: Unexpected: 2 [I2] |
| Exhilarated: 1 | Major: 1/1 [E1] | | | | | | | | | |
| Longing: 3 | Major: 1/2 [E1]; Minor: 1/2[E1] | Fast: 1/2 [E1]; Slow: 1/2 [E1] | Loud : 1/1 [E1] | | Anapaestic : 1/1 [E1] | | Legato: 1/1 [E1]; Staccato: 1/1 [E1] | Interval - Size: Seventh/Ninth : 1/1 [E1]; Fourths : 1/1 [E1]; | Contour: Rising : 1/1 [E1] | Simple: 1/1 [E1]; Chord: Dominant seventh: 1/1 [E1] |
| Love: 2 | Major: 2/2[E2] | Moderate: 2/2[E2] | | | | | Legato: 2/2 [E2] | Interval: Thirds/sixths: 2/2 [E2]; Seventh/Ninth: 1/2 [E1]; | Contour: Dolciata S-curve: 1/1 [E1] | Chord: Dominant or supertonic seventh: 1/1 [E1] |
| Majestic: 1 | | Fast: 1/1 [E1] | Loud: 1/1 [E1] | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mysterious: 3 | Minor: 1/1 [E1] | Slow: 1/1 [E1] | Soft: 1/1 [E1] | | | | | | | |
| Powerful: 6 | Major: 1/2 [E1]; Minor: 1/2 [I1] | | Loud: 1/2 [I1]; Soft: 1/2 [E1] | | | Bright: 1/1 [E1] | Staccato: 1/2 [I1]; Non Legato: 1/2 [E1] | High: 2/3 [E2]; Low: 1/3 [I1]; Interval - Size: Large: 1/3 [E1]; Octave: 1/3 [E1]; Unison: 1/3 [E1] | Unmelodious: 1/1 [I1] | Consonant: 1/1 [I1] |
| Strength: 1 | | | Loud: 1/1 [E1] | | Pulse - Clarity: High: 1/1 [E1] | | | Deviation: High : 1/1 [E1]; Variability: Large: 1/1 [E1] | | Dissonant: 1/1 [E1] |
| Tears: 1 | | | | | | | | | Sequence: 1/1 [I1]; Pitch Ornament - Appoggiatura : 1/1 [I1] | Harmonic progression: Descending cycle of fifths to the tonic: 1/1 [I1] |
| Touched: 1 | | | Loud: 1/1 [I1] | Spectral flux (timbral change): High: 1/1 [I1] | | Roughness: High: 1/1 [I1]; Noisiness: High: 1/1 [I1]; Spectral centroid: High: 1/1 [I1] | | | | |

*Note*: The numbers, letters and the criterion for selection of DHT experiences in the table follow the same conventions as those in Table 2 and 4.

## Conclusion

We introduced MuSED, a compilation of musical features–emotion association (MEA) derived from self-reported emotional responses to music within the available literature spanning 1892–2026. The MuSED resource can be seen as a complement to other important, related projects such as EMMA and PUMS, which look at the association between intact music stimuli and emotions. The different ways the database has been put to use in this paper have demonstrated its efficacy by drawing attention to five observations across more than a century of research. First, several musical features (tempo, loudness, and mode) are relatively stable across historical time, emotion models, and locus—thereby supporting a reliable empirical foundation for MEAs. Second, across the reviewed papers, happy and sad were the most investigated emotions and provided the most stable associations with the majority of musical features. Third, positioning emotions within V-A-D (Valence-Arousal-Dominance) space provides a useful complementary and efficient framework for clustering and comparing findings. However, replacing discrete emotion categories as the primary unit of analysis should be approached with

caution, because emotions that occupy similar positions in V-A space but differ in dominance may be associated with different musical features (e.g., anger and fear). Fourth, emotion locus research is skewed; the historical dominance of perceived-emotion research means that more is known about how music expresses emotion than about how it makes listeners feel, although this has been changing over the last decade. Fifth, research attention on the association between the profound, DHT experiences (such as awe, chills and being moved) and musical features is limited, and consistently replicated associations remain scarce. This is despite the extraordinary significance of these experiences.

Instead of creating music purely for the purpose of evoking particular emotions—an interest more apt for machine learning—MuSED provides researchers, composers, educators, and music appreciators with a straightforward, structured, and evidence-based way to access the associations between musical features and emotions/experiences based on access to a comprehensive evidence-based dataset. It draws attention to the amount of knowledge we have on each MEA, and helps users to identify, verify, and interrogate relationships between musical features and associated emotions. MuSED is therefore not just a tool for understanding music-emotion association, but also a prospective driver of further research questions.

## Data Availability

The Musical Feature–Self-Reported Emotion Database (MuSED), version 2026-10-30, is available on Figshare at https://figshare.com/s/02992e3669b5a140e10a (data citation: 37).

The database contains 1,326 musical feature–emotion associations extracted from 92 empirical sources published between 1892 and 2026. The database is provided in both Excel (.xlsx) and CSV(.csv) formats. The database contains the following sheets: the MuSED sheet, which contains the Musial feature-emotion associations; README, which provides an overview of the database and its intended uses; the Musical Feature Codebook, which maps source terminology onto the consolidated MuSED musical features; the Emotion Codebook, which maps source emotion labels onto consolidated MuSED emotion labels; and the Quadrant Codebook, which maps consolidated emotion labels to quadrants and dominance.

## Code Availability

No custom code has been used.

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